The bird fauna of Melbourne: changes over a century of urban growth and climate change, using a benchmark from Keartland (1900)

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Abstract
The bird fauna of Melbourne has changed in many ways since the 19th century, and this paper documents some of these changes using Keartland's paper as a benchmark for the 19th century, along with our own experience for recent decades. Woodland birds declined substantially as woodlands were cleared in the 19th century, and several species became locally extinct. Farmland birds prospered and then declined as farmland was converted to housing. Some forest birds colonised gardens and parks as trees and shrubs matured through the 20th century. Planting of native shrubs has benefited some species such as Little Wattlebird, and complex competitive interactions between aggressive honeyeaters and other birds are involved in shaping the bird fauna and the ecosystem. Climate variability has played a role, with droughts encouraging waves of immigration. In recent decades there have been spectacular waves of colonising species from inland Australia (Galah, Sulphur-crested Cockatoo, Little Corella and Crested Pigeon), the eastern seaboard (Rainbow Lorikeet) and the western plains (Long-billed Corella). Introduced European birds declined substantially during the 1997-2010 drought. Conservation of native vegetation has been the main factor contributing to the high diversity still represented in Melbourne's bird fauna. (*The Victorian Naturalist* **128** (5) 2011, 210–231)

Keywords: urban birds; historical change; declining birds; colonisation; climate change

Introduction

In global terms Melbourne is a new city (first settled in 1836 and officially declared a city in 1847) and it is now a large city, with a population of about 4 million people spread over approximately 880 000 ha of land, of which about 400 000 ha have been urbanised. It occupies an area of fertile land in the temperate part of south-eastern Australia (38° 45′ S, 145° E), and spreads from the sheltered coast of Port Phillip Bay to the nearby forested hills and valleys to the north and east and the volcanic grassland plains to the west (Fig. 1). Rainfall varies from >1200 mm in the Dandenong and Yarra Ranges to <400 mm in the dry volcanic plains to the west; hence a great variety of habitats are represented in the current area of Greater Melbourne. The Yarra River and several smaller rivers flow from the hills to the bay, and the Yarra estuary was the initial focus of Eurasian settlement from 1836. The area was occupied by low densities of Aboriginal people of the Kulin nation for many centuries. The current area of Greater Melbourne was estimated to support about 29 000 people in 1851 before the gold rush, and 478 000 in 1901 (McCarty and Schedvin 1978). Growth continued in the 20th century to approximately 3 million in 1970 and then to the present level of a little over 4 million. Substantial changes in native vegetation have accompanied this population growth, with consequent changes in habitat for flora and fauna. Climate variations have also contributed to change, with droughts or dry periods recorded at various times, most recently from 1997 to 2010.

This paper examines some of the changes in bird fauna that have accompanied these events. The primary brief was to use a specific document (Keartland 1900) as a benchmark for describing changes from the late 19th century to what we now know in the early 21st century. George Arthur Keartland arrived in Melbourne as a two-year-old in 1848, and lived there till his death in 1926 (McEvey 1983). He worked as a compositor for *The Age* newspaper, and became an avid amateur birder and naturalist from the 1880s, working with the Field Naturalists Club of Victoria and contributing to the formation of the Australasian Ornithologists Union (forerunner to Birds Australia, soon to be BirdLife Australia). He gained a reputation as a taxidermist and egg-collector, and contributed to two major inland expeditions. His 1900 paper gave an excellent description of the birds of the Greater Melbourne district in the latter half of the 19th

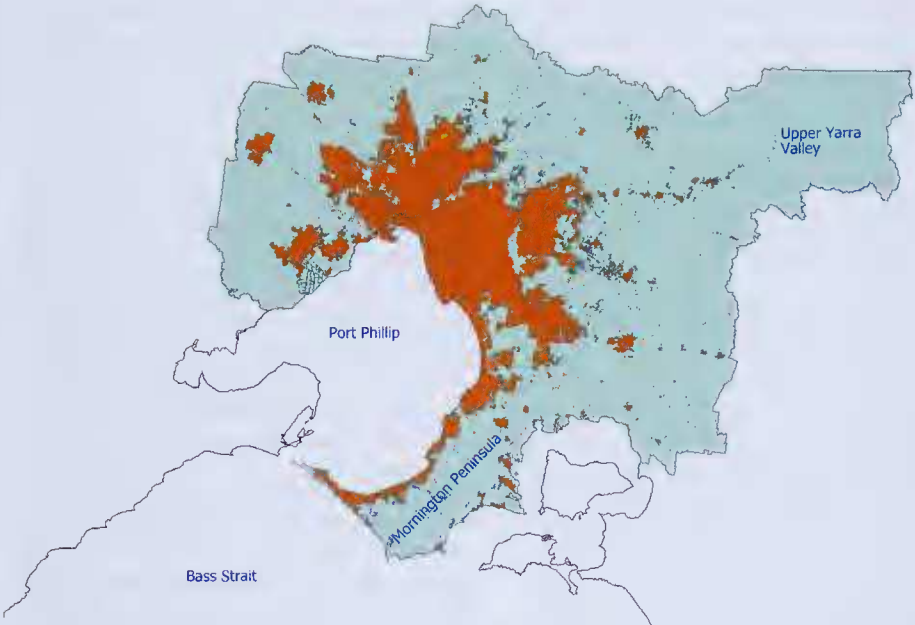

Fig. 1. Map showing the Greater Melbourne area (green shading) and the urbanised parts of Greater Melbourne (red shading).

century, including changes that had become evident to him and others during that period.

Two main sources have been used for modern information. One is the Atlas of Victorian Wildlife (soon to be relaunched as the Victorian Biodiversity Atlas). The other is the sum of personal observations by the authors (resident in or near Melbourne from 1973 to the present (RHL) and from 1963 (PWM)) and their colleagues, including members of the main bird organisations (Birds Australia, Bird Observation & Conservation Australia and the Victorian Ornithological Research Group). Some literature also was consulted but a comprehensive literature review was not possible in the time available. Such a review would undoubtedly add detail but is not considered likely to alter the main conclusions from this paper. Some valuable sources of further data include accounts of birds in suburban gardens (Kloot and McCulloch 1980), changes over time at specific locations such as Emerald (Twaits 1982), Box Hill (Kloot 2000) and Long Forest (Hewish *et al.* 2006), distributions and habitats of birds in Melbourne (Aston and Balmford 1978) or Victoria (Wheeler 1967; Emison *et al.* 1987) and national distributions of birds from Atlas projects (Blakers *et al.* 1984; Barrett *et al.* 2003). Records from the Victorian Biodiversity Atlas have been used as a secondary source, and would be worth examining in more detail.

The paper also considers the likely causes of observed changes. Information on habitat use by individual species and the timing of observed changes can be used to distinguish whether changes are likely to be due to changes in habitat availability, competition from other species, or climatic events.

Methods

Information for 1850–1900 from Keartland (1900)

Keartland provided narrative accounts for 185 bird species for which he had personal experience in the greater Melbourne area, drawing also on information from fellow naturalists from as long ago as the 1850s. These accounts were perused (after translating some archaic names) to see if the comments could apply in modern times (suggesting that populations may

have been stable, or to have varied in proportion to available habitat). Any deviations were highlighted and classified into a number of groups (species that appear to have increased or decreased markedly since that time). Changes observed by Keartland and his colleagues in the latter part of the 19th century were also noted. For many species, Keartland provided valuable ecological information, while for a few others he frustratingly provided just a description of their appearance or behaviour, limiting useful comment on any change in status. In a very few cases, some doubt may remain about whether the species were correctly identified or actually recorded in the Melbourne area: attention is drawn to those few cases. Information from Keartland (1900) also was compared to the lists and notes of birds in the Box Hill district from 1895 to 1899 (by Robert Hall, as collated and summarised by Kloot [2000]). Hall's observations lend support to some of the more interesting observations of Keartland.

Recent information 1973–2011

Personal experience was used as the main source of recent information, based on observations by the authors and colleagues from the mid-1960s to 2011. During this time RHL lived in Parkville (1973-75), Gippsland (1975-77), Coldstream (1977-79), Emerald (1979-87) and Viewbank (1987-2011), working out of Heidelberg from 1986 and making observations widely, but especially near his home, close to the confluence of the Plenty and Yarra Rivers. PWM lived in Mentone from 1963 to 1974, and then in the Heidelberg area for the rest of the period apart from two years at Diamond Creek (1979-1981). A distillation of information from fellow birders was also used, including reports in the periodicals of the major bird societies and our own research compilations (e.g. Menkhorst 1976). Data were examined from the Atlas of Victorian Wildlife, to give a picture of reporting rates for each species over recent years.

Changes and trends

Three primary periods of change could be identified from this process: 1850–1900 (as reported by Keartland 1900 and Hall [Kloot 2000]); 1900–1970s (comparing their observations with those at the start of the modern period) and 1970s to 2011 (from recent observations).

Results

Keartland's list of species is quite similar to the list that would be made in modern times, by an observer focusing on bush-birds and not visiting special habitats for shorebirds or seabirds. But clearly there have been some major changes in abundance, and some species are now absent or extremely rare (notably Australian Bustard *Ardeotis australis*, Superb Parrot *Polytelis swainsonii*, Masked Owl *Tyto novaehollandiae*, Eastern Grass Owl *Tyto longimembris*, Brown Treecreeper *Climacteris picumnus*, Crested Bellbird *Oreoica gutturalis*, Grey-crowned Babbler *Pomatostomus temporalis*, White-browed Babbler *Pomatostomus superciliosus*, Regent Honeyeater *Anthochaera phrygia* and Fuscous Honeyeater *Lichenostomus fuscus*). There also have been gains, but some of them may be due to increased observer activity and expertise (and focus on shorebirds and seabirds) rather than real changes. Keartland did not deal explicitly with introduced birds, but he mentioned the introduction of sparrows and it seems that his choice not to discuss them further could have been due to a philosophical position or editorial policy. The main changes in abundance are considered below by period of change.

Possible errors or records that need to be checked

Just a few of Keartland's records seem discordant with what is currently known of the species, and further investigation is needed to establish their accuracy. This implies no disrespect to Keartland and his colleagues, who were working without field guides and other modern tools such as sophisticated optics, but did make frequent use of a shotgun. In this paper, the following four cases will be disregarded:

- Keartland mentions two species of small penguin (as Little Penguin *Eudyptula minor* and Fairy Penguin *Eudyptula undina*), which are no longer differentiated.
- Spotted Nightjars *Eurostopodus argus* inhabit the arid north-western parts of Victoria, and nightjars in Melbourne are much more likely to have been White-throated Nightjars *Eurostopodus mystacalis*.
- Orange-bellied Parrots *Neophema chrysogaster* are extremely rare, and found mainly in coastal habitats and not in the breeding season (as they breed in Tasmania). Keartland recorded

them (as 'Blue-banded Grass Parrot *Euphema chrysogaster*') in large flocks near Melton in spring and as scattered pairs throughout the year all round Melbourne. These are more likely to have been Blue-winged Parrots *Neophema chrysostoma* (not mentioned by Keartland).

- Marsh Sandpipers *Tringa stagnatilis* are regular visitors to saline wetlands near the coast of Port Phillip Bay, where they occur with a range of other migratory shorebirds. Keartland records 'solitary birds of this species on the margins of the lagoons at Heidelberg', and mentions no other migratory shorebirds except for Latham's Snipe *Gallinago hardwickii*. His Marsh Sandpipers are more likely to have been Common Greenshank *Tringa nebularia*, Wood Sandpiper *Tringa glareola* or Common Sandpiper *Actitis hypoleucos* that are much more likely to be seen 'as solitary birds' than are Marsh Sandpipers. A number of common migratory shorebirds that sometimes visit freshwater wetlands are also candidates such as the Sharp-tailed Sandpiper *Calidris acuminata* but these species are almost invariably in flocks.

The following records deserve further scrutiny but are accepted provisionally in this paper:

- Records of Masked Owl and Eastern Grass Owl may well be correct, and both species have been seen near Melbourne in recent years; however, both can be confused with Eastern Barn Owl *Tyto javanica* and it would be reassuring to have more information about the records, especially the reference to 'large numbers' of Eastern Grass Owl. We note that Hall also listed both these species in the Box Hill area (Kloot 2000), and Wheeler (1967) mentioned a minor invasion of Eastern Grass Owl in winter 1905.
- Keartland's records of Superb Parrot (as 'Barraband's Parrakeet *Polytelis barrabandi*') and White-browed Babbler are both surprising as these species are now confined to dry forests north of the Great Dividing Range. However, they are quite distinctive birds and unlikely to be mistaken: they appear to have suffered genuine range contractions. It is unfortunate that no details were provided about the status of White-browed Babblers, although earlier papers give specific records for Long Forest and Toolern Vale (Hewish *et al.* 2006). Keartland's records of Superb Parrots were based on hearsay rather than personal observation, but they are quite specific, stating that the species was 'at one time very common in the vicinity of Keilor and Heidelberg', but had 'quite disappeared of late years, the only specimens shot being escaped cage pets'.

Increases or fluctuations 1850–1900

Keartland considered that Australian Magpies had 'become very numerous since they enjoyed the protection of the Game Act'. He also said that a number of Fuscous Honeyeaters had 'lately arrived' in the Melton forests and in the past two years (1898–1900) Purple-crowned Lorikeets *Glossopsitta porphyrocephala* had appeared 'in considerable numbers in our parks and gardens'. More surprisingly, he reported that Cicadabirds *Coracina tenuirostris* ('Jardine's Campephaga *Campephaga jardinii*') had appeared near Melbourne 'within the last few years'. The last three observations may be examples of erratic irruptions rather than trends.

Keartland identified no other species that increased over this period, though introduced species would clearly be in that category. He commented on the erratic spring arrival of White-browed Woodswallows *Artamus superciliosus* and Masked Woodswallows *A.personatus*, considered harbingers of hot summers: similar comments could be made in modern times. More surprisingly, he reported a temporary influx of 'a great many' Eastern Grass Owls in about 1890, during a mouse plague.

Decreases 1850–1900

In his introduction, Keartland lamented the denudation of native vegetation within 30 km of Melbourne, and highlighted five bird species that had declined markedly since 1850. These were 'Bronzewing Pigeons' following the destruction of the tea-tree (presumably Brush Bronzewing *Phaps elegans*); Little Lorikeet *Glossopsitta pusilla* and Regent Honeyeater as Red Gum and Box forests were used for firewood; Rainbow Lorikeet *Trichoglossus haematodus* (from forests generally) and Australasian Bittern *Botaurus poiciloptilus* (whose booming notes were 'listened for in vain', presumably at wetlands where they had been heard calling previously).

Keartland also mentioned recent decreases for many other species, and considered that the following 19 species had declined:

- Common Bronzewing *Phaps chalcoptera* (becoming rare as much hunted; disappeared from immediate vicinity of city but a few still seen at Melton and Beveridge);
- Brush Bronzewing (becoming rare with loss of tea-tree habitat, but 'occasionally odd birds are shot at Mordialloc and Cheltenham');
- Australasian Bittern (odd birds occasionally shot near lagoons in vicinity of Heidelberg);
- Black Kite *Milvus migrans* (previously common at slaughter yards);
- Brolga *Grus rubicunda* (rare near Bulla, previously shot in 1860s at Fairfield Park);
- Australian Bustard ('frequently seen during the spring and summer months on the open plains of Keilor and Werribee');
- Yellow-tailed Black-Cockatoo *Calyptorhynchus funereus* (common along the Yarra in the 1850s, e.g. at Heidelberg, but subsequently confined to the Dandenong Ranges);
- Gang-gang Cockatoo *Callocephalon fimbriatum* (becoming scarce as much sought [presumably as specimens or pets], easily shot but occasionally seen 'as near as Oakleigh');
- Rainbow Lorikeet (at one time very numerous near Melbourne, e.g. in Blue Gums of Parliament House, but now very scarce; not common since March 1874 when they destroyed nearly all the ripe pears in gardens at Dandenong);
- Little Lorikeet (very numerous a few years ago near Oakleigh, but now scarce);
- Superb Parrot (said to be at one time very common near Keilor and Heidelberg, but then disappeared except for escaped cage-birds);
- Swift Parrot *Lathamus discolor* ('at one time very common; these birds are now seldom seen; a few years ago specimens were secured near Brighton');
- Azure Kingfisher *Ceyx azureus* (previously conspicuous along the Yarra and Plenty Rivers, but 'has become very rare');
- Satin Bowerbird *Ptilonorhynchus violaceus* ('still found in the Morang district although immense numbers of them have fallen victim to rabbit poison');
- Yellow-rumped Thornbill *Acanthiza chrysorrhoa* (numerous in garden plots until sparrows were introduced);
- Regent Honeyeater ('at one time very numerous near Melbourne but now extremely scarce')
- Noisy Friarbird *Philemon corniculatus* ('now rare near Melbourne, but a few pairs still construct their stringybark nests and rear their broods at Whittlesea');
- Grey Currawong *Strepera versicolor* ('now somewhat rare');
- Tree Martin *Petrochelidon nigricans* ('at one time very numerous in what is now known as Clifton Hill; ...still numerous at Heidelberg and the Plenty River').

Some of these changes (increases and decreases) may have involved cyclical changes in abundance or erratic irruptions rather than long-term trends, especially with respect to species that are known to be nomadic (e.g. lorikeets and some honeyeaters).

Increases 1900–1970s

A few species seem to have increased between 1900 and the 1970s:

- Kelp Gulls *Larus dominicanus* were first seen in Victoria in 1954, in Port Phillip Bay (Wheeler 1967). By the 1970s low numbers had become regular near Port Phillip Heads (and a few pairs bred annually on Seal Rocks in Western Port). However, the species remains extremely rare in the metropolitan area.
- Fan-tailed Cuckoos *Cacomantis flabelliformis* were described by Keartland as less common than Pallid Cuckoos, and generally confined to hilly country. By the 1970s the species had become common in a range of forest habitats, including in the lowlands along the Yarra River.
- Bell Miners *Manorina melanophrys* were described by Keartland as mainly inhabiting Gippsland, but they were 'occasionally met with at Ringwood and Bayswater'. Colonies had become established in many parts of eastern Melbourne and the nearby ranges and river valleys by the 1970s (McCulloch and Noelker 1974).
- Little Wattlebirds *Anthochaera chrysoptera* were described by Keartland as very numerous in coastal tea-tree from Brighton to Schnapper Point, but seldom seen far inland. In the 1970s the species was still mainly coastal (e.g. at Mentone always in the tea-tree and banksia belt), but had begun to expand into various suburban habitats away from the coast, where

lots of proteaceous shrubs had been planted, for example the grounds of Monash University Clayton Campus.

- Red Wattlebirds *Anthochaera carunculata* were described by Keartland as 'still plentiful at Clayton and Melton, where they congregated in flocks during winter', despite being occasionally killed as game; he also described them as extremely wary. Clearly, Red Wattlebirds were somewhat local in those days, whereas they are now very common and widespread in Melbourne gardens (Kloot and McCulloch 1980).

Several waterbirds appeared to be quite scarce in Keartland's time, at least in part because they were widely shot. For example, Australian Wood Duck *Chenonetta jubata* were reported to be frequent at just two sites, Whittlesea and Melton, and their flesh was said to be highly esteemed. Chestnut Teal *Anas castanea* were said to be 'shot at Carrum' with no mention of other locations. Eurasian Coot *Fulica atra*, Australian Wood Duck, Chestnut Teal, Pink-eared Duck *Malacorhynchus membranaceus* and Black-winged Stilt *Himantopus himantopus* all appear to have increased substantially since 1900, and the first three are now common in many wetlands in the Melbourne area. Construction of new freshwater wetlands, as well as tighter hunting controls, may have helped these species. Keartland mentioned that flocks of Straw-necked Ibis *Threskiornis spinicollis* visited Melbourne in summer during 'immense flights of grasshoppers', but in modern times the species can be found more often, and not only when there are abundant grasshoppers. Keartland made no mention of Australian White Ibis *T. molucca* or either species of spoonbill *Platalea* spp., and now all can be found quite often in and near Melbourne, with Australian White Ibis breeding regularly at Healesville and in constructed wetlands below the Westgate Bridge.

Decreases 1900–1970s

Many species appear to have decreased between Keartland's time and the early 1970s. The main examples are listed below:

- Brown Quail *Coturnix ypsilophora* were described by Keartland as being locally distributed all year 'on the grassy margins of creeks or damp, swampy flats'. He noted that in winter they fed 'largely on clover and other vegetable food, which adds to the delicacy of their flesh'. By 1970 the species was virtually absent from the Melbourne area, though populations persisted near Laverton (Point Cook) and on the Mornington Peninsula.
- King Quail *Excalfactoria chinensis* were said to be 'generally found in damp, swampy localities', where their habits were similar to those of Brown Quail. The species must have declined rapidly as it was absent from the Melbourne area for most of the 20th century, with the few records generally considered to refer to escaped cage birds. The species became rare throughout Victoria, with most records coming from wet heaths in the Grampians, Wilsons Promontory and East Gippsland. By the 1970s the only population known to persist in Victoria was on French Island, and that remains the case in 2011 despite occasional records elsewhere.
- Musk Ducks *Biziura lobata* were said to occur 'along the coast-line from Brighton to Mornington', where 'many of these birds may be seen resting placidly on the water or diving to avoid a passing boat'. The species is now scarce along this north-eastern shore of Port Phillip Bay, although many can be seen further west off Williamstown, and high numbers gather at the Western Treatment Plant and adjacent coasts.
- Australasian Gannets *Morus serrator* were often said to be seen fishing, by observers in excursion steamers in Hobson's Bay (i.e. Port Melbourne). The species is still common in Port Phillip Bay, where a few hundred pairs now breed on five navigation structures in the southern half of the bay, including the jetty at Point Wilson. Occasional birds can be seen in Hobson's Bay but the species now makes less use of the inner part of Port Phillip than it apparently did in Keartland's time.
- Great Cormorants *Phalacrocorax carbo* were said to 'frequent the Bay, the Yarra and the lakes in our reserves' in high numbers, whereas Little Black Cormorants *Phalacrocorax sulcirostris* were only 'occasionally seen at Heidelberg and other places along the course of the Yarra'. Both species still occur, but in modern times Great Cormorants are unlikely to be seen in high numbers, whereas flocks of hundreds of Little Black Cormorants can often be encountered in the Bay, with lower numbers locally on wetlands.

- Purple Swamphens *Porphyrio porphyrio* were said to 'frequent all the lagoons and swamps in the vicinity of the Yarra, from Princes Bridge upwards'. By the 1970s the species was no longer found as far downstream as the Princes Bridge, although it remained common on most vegetated wetlands at greater distance from the Central Business District (upstream along the Yarra River from Ivanhoe and also along the coast).
- Buff-banded Rails *Gallirallus philippensis* were described as 'showy waders, found on the margin of almost every sheet of water near Melbourne'. By the 1970s they had become less numerous or more shy: few people would describe them as 'showy' in modern times. However, they remain common though cryptic on most vegetated wetlands in the Melbourne area, so the change may have been in behaviour rather than numbers.
- Keartland stated that the open plains of Keilor were frequented by Australian Bustards. For most of the 20th century, bustards could no longer be found within 350 km of Melbourne. He used the past tense for this and some other species (e.g. Banded Lapwing) that still occur there, so it is not clear if he was reporting a decline during his period of observation, but it is certain that the species subsequently has become locally extinct.
- Bush Stone-curlews *Burhinus grallarius* were said to be 'found in pairs in open forest'. By the 1970s they had become extremely rare in southern Victoria, and absent from Melbourne. Just a few birds may persist south of the Divide, as there have been more recent records from the Bellarine Peninsula and Melbourne suburbs (a lone vagrant on a golf course in 2010).
- Red-necked Avocets *Recurvirostra novaehollandiae* were said to 'frequent the Carrum swamp, and the mouth of the Yarra' in the late 1800s. They no longer occur at these sites, but substantial non-breeding flocks occur at artificial wetlands near Werribee (Western Treatment Plant) and Carrum (Eastern Treatment Plant), with low numbers occasionally elsewhere. So perhaps this represents a shift in favoured locations rather than a decline. In the 1960s there were breeding records from wetlands near Lara, whereas the species is no longer known to breed in the Melbourne area.
- Plains-wanderers *Pedionomus torquatus* were described by Keartland, with some detail about behaviour and nest sites, so evidently it was not as rare as it is now, though he said nothing about its distribution. In the 1970s the species was still believed to persist in grasslands west of Melbourne, though there were few recent records.
- Little Button-quail *Turnix velox* ('swift flying Turnix') were said to be mainly inhabitants of 'the arid plains of northern Australia', but occasionally migrated south 'in great number, when driven from their home in the north by seasons of protracted drought'. It is unfortunate that these big influxes remain poorly documented. Occasional birds continued to be reported in southern Victoria, but there have been no further reports of high numbers. There does not seem to be an identification issue, as plausible text is also given for other quail species including the one that is now most common (Stubble Quail *Coturnix pectoralis*).
- Galahs *Eolophus roseicapillus* were said to be non-breeding winter visitors in 'large flocks' to the Broadmeadows and Bulla districts in the late 1800s, but by the 1970s they had become rare near Melbourne and generally less common in southern than northern Victoria (Wheeler 1967). [They have subsequently increased greatly, see below.]
- Laughing Kookaburras *Dacelo novaeguineae* were described by Keartland as numerous all round Melbourne, 'frequenting all the parks and gardens where they make havoc with the goldfish in the lakes'. They remain widespread but have become scarce in inner city parks, although they may be re-occupying some (e.g. the Fitzroy Gardens, where they nest in a palm tree where fronds have been excised).
- Brown Treecreepers were apparently common in Keartland's time: he described them as 'one of the tamest birds in the forest'. Unfortunately, he then proceeded to describe their behaviour and said nothing about their distribution. He used them as a benchmark for describing White-throated Treecreepers *Cormobates leucophaea*, which he said were 'frequently found in hilly country', the obvious implication being that Brown Treecreeper was the more common 'default' species in the lowlands. The species was also recorded in the late 1800s in the Healesville-Warburton

area (Anon. 1891) and at Box Hill by Robert Hall (Kloot 2000). Brown Treecreepers are now rare in the Melbourne area, and essentially confined to the remaining box-ironbark forests to the south-west (Brisbane Ranges, Long Forest and their environs), and they have continued to decline in those areas (Hewish *et al.* 2006).

- Satin Bowerbirds were said to be 'still found in the Morang district although immense numbers of them have fallen victim to rabbit poison'. Oddly, Keartland made no mention of them damaging fruit crops, although he laid that charge on many other species. The species continued to decline and by the 1970s was rare close to Melbourne, with the closest populations being near Hoddles Creek and Healesville.
- Superb Fairy-wrens *Malurus cyaneus* were very common in Keartland's time, being found in 'nearly every hedge or patch of scrub around Melbourne': he describes a brood hatched in Parliament Reserve in 1898. In the 1970s the species remained common on the outer fringe of Melbourne, along the Yarra River and in some of the larger city parks, but could not be described as ubiquitous.
- Southern Emu-wrens *Stipiturus malachurus* were described by Keartland as 'active among the short heath and coarse grass at Oakleigh and Bayswater'. They had disappeared from those locations by the 1970s, but could still be found in heathy woodland and swampy watercourses in the foothills of the Dandenong Ranges, e.g. near Yellingbo, Gembrook and Beaconsfield.
- Pilotbirds *Pycnoptilus floccosus* were found in Bayswater according to Keartland, and that was the only location he knew for them: he once saw one being eaten by a Southern Boobook *Ninox novaeseelandiae*. Hall also recorded them at Box Hill (Kloot 2000). By the 1970s the species had disappeared from all such middle suburbs but proved to be quite common at higher elevations in the Dandenong and Yarra Ranges (where it had probably always been).
- Striated Fieldwrens *Calamanthus fuliginosus* were said to be numerous on sandy heaths of the Oakleigh district, where they are no longer present. From the 1970s, the species was confined mainly to coastal saltmarsh, with perhaps just a few persisting in grassy habitats further inland (e.g. Twaits 1982 referred to occasional records near Yellingbo and Cardinia).
- Speckled Warblers *Chthonicola sagittata* were said by Keartland to be 'generally found in the open forest'. They are no longer found within Melbourne, though some persist in dry forest to the west (e.g. Long Forest and You Yangs); some may have persisted in dry forest near Whittlesea and Warrandyte into the 1970s or 1980s.
- Yellow-rumped Thornbills were described by Keartland as 'still very common a few miles from Melbourne', despite the decrease noted in suburban gardens when sparrows were introduced. In the 1970s they remained common in farmland outside Melbourne, and in patches of remnant farmland within Greater Melbourne, but had clearly declined greatly as farms gave way to housing.
- Singing Honeyeaters *Lichenostomus virescens* were described as being 'fairly numerous among the casuarinas at Werribee'. By the 1970s the species was virtually unknown in Melbourne, with the nearest populations being on the ocean coasts of the Bellarine and Mornington Peninsulas. The species has expanded back into coastal parts of Melbourne since the 1970s.
- Spiny-cheeked Honeyeaters *Acanthagenys rufogularis* were apparently quite common winter visitors to Melbourne in the late 1800s: Keartland wrote that 'during the winter months they become very tame and frequent the most popular reserves in the city'. This no longer happens, though they continue to be winter visitors to nearby towns such as Bacchus Marsh (M Hewish pers. comm.) and there are resident populations on the Bellarine and Mornington Peninsulas: the latter may be newly established.
- White-fronted Chats *Epthianura albifrons* were said to favour 'dried swamps and sandy heathy country'. These habitats have become rare in Greater Melbourne where the species is now confined mainly to coastal saltmarsh and to some wetlands and associated pasture beyond the city fringe, as well as limited dune habitats and golf courses near the coast.
- White-naped Honeyeaters *Melithreptus lunatus* were said to be common among eucalypts in Studley Park. The species is now rarely seen in inner-city parks although it

remains common in reserves with remnant eucalypt forest in the outer suburbs (e.g. Warrandyte).

- Noisy Friarbirds declined during Keartland's time but a few pairs continued to nest near Whittlesea. The decline evidently continued and by the 1970s the species was just a rare vagrant to Melbourne, occurring mainly north of the Divide (e.g. in the Goulburn Valley).
- Grey-crowned Babblers were evidently quite common, as Keartland wrote about their 'arresting' antics and notes but said nothing about their distribution. By the 1970s they were virtually absent, with just a few persisting on the Mornington Peninsula, at Canons Creek in Western Port, Mordialloc and at a golf-course near Koo-wee-rup: vagrants were also reported near Emerald.
- White-browed Babblers were also described but nothing was said about their distribution. The species is known to have been resident in the Long Forest near Melton to at least the 1940s (Hewish *et al.* 2006), but no longer occurs south of the Great Divide (Emison *et al.* 1987). Hewish *loc. cit. et al.* (2006) report that Keartland (1892) also recorded Chestnut-crowned Babblers *Pomatostomus ruficeps* at Long Forest, an extremely implausible record, but he did not persist with that claim in his paper of 1900. It seems likely that he used the term 'chestnut-crowned' to differentiate White-browed Babblers from the lighter-crowned Grey-crowned Babblers.
- Spotted Quail-thrush *Cinclosoma punctatum* were said to 'prefer rocky country or dense scrub', and to be 'common at Bayswater, near the Dandenong Ranges'. By the 1970s they had disappeared from Melbourne suburbs, with just a few persisting east of the Dandenong Ranges (in Bunyip State Park, R Loyn unpubl. and E McNabb pers. comm.) and on dry ridges in and near Kinglake National Park (D Rogers, pers. comm.), as well as in the Brisbane Ranges far to the south-west.
- Cicadabirds *Coracina tenuirostris* are currently scarce summer visitors to the forested ranges east and north of Melbourne, and there has been no repeat of the influx noted in the late 19th century. This may be an example of an erratic irruption rather than a trend.
- Rufous Whistlers *Pachycephala rufiventris* were described as 'abundant along the banks of the Yarra and Plenty Rivers.' In the 1970s they remained fairly common summer visitors but hardly abundant.
- Crested Bellbirds were reported by Keartland as 'occasionally heard in the Melton district'. They continued to be reported very rarely at Long Forest into the 1970s (Hewish *et al.* 2006), but had clearly declined substantially.
- Olive-backed Orioles *Oriolus sagittatus* were said to be 'common all around Melbourne', and 'very destructive amongst soft fruit especially mulberries'. They remain fairly common summer migrants in large reserves and along the Yarra River, and sometimes enter gardens to eat soft fruit including mulberries. However, Keartland's description would be a gross exaggeration of their recent status, and they appear to have declined substantially.
- Leaden Flycatchers *Myiagra rubecula* were described by Keartland as 'found in the Ringwood and Croydon districts'. They no longer occur there, except as scarce passage migrants, but continue to be summer visitors to dry forest further from the suburbs.
- Restless Flycatchers *Myiagra inquieta* were described by Keartland as 'numerous at Melton and Heidelberg'. By the 1970s they had disappeared from Heidelberg but continued to be present in dry forest west and north of Melbourne.
- Jacky Winters *Microeca fascinans* were described by Keartland with no comment about local status, perhaps suggesting that they were fairly widespread. The species is now rare near Melbourne, and found regularly only in the dry forests to the south-west, notably the Brisbane Ranges, You Yangs, Long Forest (where Hewish *et al.* 2006 report continuing declines) and in some open forests in the foothills of the Dandenong Ranges.
- Hooded Robins *Melanodryas cucullata* were described by Keartland as being found 'at Clayton, Oakleigh, Melton and Bayswater', mainly in open country or 'burnt land'. They no longer occurred at these sites in the 1970s, but persisted in some heathy woodland further east (near Gembrook and Yellingbo) and in dry woodland further west in the You Yangs and Brisbane Ranges. Hewish *et al.* (2006) report that they remained common in Long Forest and Toolern Vale to the 1960s, but no longer occur there.
- Tree Martins must have continued their

decline, because by the 1970s they had become rare in Heidelberg (Warringal Conservation Society 1981) where they were still common in Keartland's time. They continue to occur in Melbourne mainly as passage migrants and breed in a wide range of forest types beyond the suburbs. The species has also declined in Perth in recent years (Abbott 2009).

- Bassian Thrushes *Zoothera lunulata* were said to be 'most plentiful in the ti-tree scrubs of the Mordialloc district and along the Dandenong Creek'. They are now rare visitors to such areas and essentially confined to wetter forest at higher altitude, including the Dandenong Ranges. Occasional birds continue to appear in Melbourne suburbs at lower altitude (e.g. Heidelberg, and the Royal Botanic Gardens in South Yarra).
- Red-browed Finches *Neochmia temporalis* were described by Keartland as the most common finch, and he described 'large flocks at Heidelberg, feeding on the grass seed found on the river flats'. They remain the most common native finch, and in the 1970s flocks could still be found at Heidelberg although they rarely exceeded ~15 birds, so it seems that some decline had occurred.
- Diamond Firetails *Stagonopleura guttata* were said to be found 'in open forest at Melton, Oakleigh and Yan Yean'. By the 1970s they had disappeared from all those sites, but still occurred in open forest further south-west in Long Forest, the You Yangs and the Brisbane Ranges.

Increases 1970s to 2011

Many species have increased dramatically in Melbourne since the 1970s, including conspicuous species such as parrots. Indeed, there seem to have been several waves of colonisation by granivorous or nectivorous birds, with at least one added to the list of common resident species every decade (Galah *Eolophus roseicapillus* in the 1970s, Sulphur-crested Cockatoo *Cacatua galerita* in the 1980s, Long-billed Corella *Cacatua tenuirostris* and Little Corella *C. sanguinea* in the 1980s and 1990s, Rainbow Lorikeet in the 1980s and Crested Pigeon *Ocyphaps lophotes* in the late 1990s and 2000s). Several other species increased to a lesser extent and all these changes are documented further below.

- Brown Quail have increased in number south-west of Melbourne, expanding from Point Cook to Point Wilson. Occasional birds have also been found in reserves within the city, e.g. at Banyule Flat.
- Common Bronzewings have increased in many parts of Melbourne where there is open native forest, especially along the Yarra River. They have become familiar and tame in parks from Healesville through Warrandyte and Heidelberg to Yarra Bend, whereas in the 1970s they were extremely rare in the middle suburbs. They have benefited from plantings of Silver Wattle *Acacia dealbata*, the seed of which forms a favoured food source.
- Crested Pigeons were occasionally seen in Melbourne in the 1970s, and were often dismissed as possible escapees (e.g. pairs were seen in Parkville, perhaps escaped from Melbourne Zoo). In the late 1990s the reports suddenly proliferated and the species is now a very common bird in most suburbs, inhabiting open areas where they feed from sports ovals and other open grassland. Groups of up to a dozen or so are often seen perching on overhead wires close to suitable open habitat, just as Spotted Doves *Streptopelia chinensis* do in the more densely built-up areas.
- Little Penguins *Eudyptula minor* began breeding at St Kilda in 1974, and the population increased to its current estimated level of 1200 adults (260+ breeding pairs) (http://stkildapenguins.com.au). Previously the species had been considered just a non-breeding visitor to this area.
- Australasian Darters *Anhinga novaehollandiae* were rare near Melbourne in the 1970s. Small breeding populations established around several billabongs on the Yarra River floodplain in 1975 (Menkhorst 1976) and have become more or less permanent.
- White-bellied Sea-Eagles *Haliaeetus leucogaster* were absent from Melbourne in the 1970s, when the nearest resident birds were on French Island in Western Port. Since then pairs have become established on large water storages in the Melbourne area (and at Lake Connewarre, south of Geelong). Transient birds are seen with increasing frequency around Port Phillip Bay.
- Black Kites have colonised the Werribee area from the late 1990s, after being virtually absent for more than a century, and several pairs now breed there. Wheeler (1967) described them as rare visitors to western Victoria, with

occasional irruptions (e.g. 1952).

- Buff-banded Rails appear to have increased at many wetlands in the Melbourne area since the 1970s, often foraging on nearby grassland including parks and golf-courses.
- Silver Gulls *Chroicocephalus novaehollandiae* are generally considered to have increased in number in the Melbourne area. They began nesting on Mud Islands in 1959 (Menkhorst *et al.* 1988) and several tens of thousands now breed there (Menkhorst 2010), many commuting to the Melbourne suburbs to forage. Silver Gulls also breed on flat roofs in inner bayside suburbs and at Frankston, and occasionally elsewhere (e.g. a solitary pair at Banyule Flat from 2009).
- Pacific Gulls *Larus pacificus* were confined to the coastal fringe in the 1970s, but now flocks regularly visit a rubbish tip near Cranbourne, 12 km inland. This may represent a small change in behaviour rather than an increase in numbers. The species remains more dependent on tidal habitats than most of the world's gulls.
- Yellow-tailed Black-Cockatoos were confined to wet or heathy forest in the 1970s, in the Dandenong Ranges and other extensive forest areas further out. Described as transient and rare along the Yarra Valley between Warrandyte and Ivanhoe in the mid-1970s (Menkhorst 1976), the species has steadily increased the frequency and regularity of visits. Flocks often feed on the cones of mature planted pine trees *Pinus* spp., and extract grubs from wattle trees *Acacia* spp. By the 1990s low numbers appeared resident in some of these areas (e.g. Warrandyte) and small flocks or family groups often visited other areas, especially in winter. By 2011 the size of these flocks had increased (up to 70-100 in middle suburbs) and pairs appeared to be resident and possibly breeding as far downstream as Heidelberg. In winter, flocks of up to 30 birds visit pine trees in inner-city Jolimont.
- Gang-gang Cockatoos probably made increasing use of the suburbs over this period, as non-breeding visitors from late summer to early spring. Flocks of up to 20 were quite often encountered in the middle or outer eastern and northern suburbs in the 1990s and 2000s, feeding on seed from eucalypts and exotic plants such as Hawthorn *Crataegus monogyna*. VBA records showed a peak in 2005-09, but the increase was not as marked as for the other cockatoo species.
- Galahs were considered rare in Melbourne in the early 1970s, and records were sometimes dismissed as escaped cage-birds. However, pairs and small flocks became increasingly evident through the decade, often feeding from short grass on sports ovals. By the 1980s and 1990s they had become a common species in many suburbs, breeding in scattered River Red Gum *Eucalyptus camaldulensis* in open country such as farmland on the western fringe and parklands in middle suburbs such as Viewbank and Bundoora (but not in more densely treed habitats next to the major rivers). A southward movement had been noticed by Wheeler (1967), who described them as common especially in northern Victoria, and 'becoming more common in southern districts'. They are still common, though numbers may have declined slightly in the 2000s. Flocks now tend to be small, and pairs are often seen flying long distances between feeding and nest or roost sites. They do not often associate with other cockatoos, and may have suffered in competition with them although they remain much more common than they were 40 years ago.
- Long-billed Corellas inhabited south-west Victoria in the 1970s, >100 km west of Melbourne (Emison *et al.* 1987). In the 1980s low numbers began to be seen in Melbourne. By the 1990s they had become common, and flocks of up to 100 or more could be found in some suburbs, feeding from open grassland and nesting and roosting in large old River Red Gums.
- Little Corellas were even more distant from the city in the 1970s, inhabiting the arid interior of Australia and usually coming no closer than the mallee in the north-west of the State, >400 km north-west of Melbourne (Wheeler 1967). In the late 1980s low numbers began to be seen around Melbourne, and breeding populations became established in some places, especially near Healesville (possibly derived from escapees). They also colonised sites in country Victoria, e.g. Lake Mokoan in the north-east. In Melbourne the increase continued through the 1990s, and flocks of up to 400 could be found along the Yarra Valley, with resident populations in many suburbs,

e.g. Eltham and Viewbank. The two corellas sometimes associated with each other but more typically formed single-species flocks. Little Corellas tend to roost in large flocks in River Red Gums near water (as they do in inland and northern Australia).

- Sulphur-crested Cockatoos were rare in Melbourne in the 1970s, though common in treed farmland nearby and along the Yarra River. A small population became established in the western foothills of the Dandenong Ranges near Ferntree Gully in the early 1980s: some believe they were derived from cage-birds which escaped during the 1983 fires. The species then increased rapidly, and was quite common by the end of the decade and through into the 2000s. They feed mainly in open country and typically nest in large old River Red Gums. They sometimes form flocks of >100 but are often seen feeding in loose groups, and appear less tightly gregarious than corellas.
- Rainbow Lorikeets were rare in Melbourne in the 1970s (e.g. Menkhorst 1976), and a few birds in Parkville were often considered to be escapees from Melbourne Zoo. In the 1980s they proliferated explosively and are now one of the most common birds in most suburbs from the inner city to the edge of the forested ranges (but not in the ranges themselves). They often nest in River Red Gums along rivers and creeks, and feed widely from blossom and fruit in parks and gardens. The population is loosely linked to populations in southern Victoria and the eastern seaboard of Australia, which were originally continuous (Wheeler 1967).
- Scaly-breasted Lorikeets *Trichoglossus chlorolepidotus* were virtually unknown in Victoria before the 1970s (they are not listed by Wheeler 1967), and were not recorded closer than south-eastern New South Wales, 400 km to the east-north-east. Low numbers were recorded in Melbourne subsequently, and very small breeding populations appear to have become established mainly in the south-eastern suburbs, e.g. at Mt Eliza but also along the Yarra Valley where they arrived sometime after 1976 (not listed by Menkhorst [1976]). The species remains scarce and many people believe the local populations originate from escaped cage-birds. The scarcity of records in intervening habitat (Gippsland) lends credence to that idea, in contrast to the other increasing species which now have continuous populations across much of their Victorian range (though there has been a recent record at Lindenow in Gippsland).
- Musk Lorikeets *Glossopsitta concinna* were erratic visitors to remnant eucalypt forest in the 1970s, but have increased in subsequent decades, with large flocks often visiting parks and gardens to feed on blossom and fruit. Their numbers continue to fluctuate seasonally and erratically, suggesting that there are both seasonal and irregular movements between the suburbs and perhaps more natural habitats elsewhere.
- Australian King-Parrots *Alisterus scapularis* were confined to the ranges in the 1970s but have recently expanded into some suburbs (e.g. Monbulk, Eltham, Viewbank and Heidelberg), in very low numbers during the 2000s: they are seen in gardens but also along the Yarra and Plenty Rivers where pairs have been found in suitable breeding habitat in the spring-summer breeding season.
- Common Koels *Eudynamys scolopacea* are summer visitors to eastern Australia, with their normal range extending south to southern New South Wales. They are rare vagrants to Melbourne but numbers of records have been increasing, and the species is now reported almost annually from parks and large gardens in a range of suburbs, especially where there are mature planted Morton Bay Figs (the fruit of which they eat). This species seems to be a leader amongst a number of frugivorous species, including White-headed Pigeon *Columba leucomela* and Australian Figbird *Specotheres viridis*, whose ranges are extending south and west from southern NSW and eastern Victoria,.
- Powerful Owls *Ninox strenua* were regarded as mysterious birds of the ranges at the start of this period, with just a few pairs known on the fringe of Melbourne (e.g. in Warrandyte and the Dandenong Ranges). Since then the number of suburban records has increased greatly, mostly in large parks or areas of native forest. Single birds have spent long periods in inner city parks such as the Royal Botanic Gardens (Menkhorst *et al.* 2005), and breeding pairs have been found at several sites along the Yarra River.
- Brown Thornbills *Acanthiza pusilla* are

arguably Victoria's most common bird, but in the 1970s they were scarce in Melbourne itself, being found only in native vegetation or large parks with plenty of shrub thickets. In the 1990s and 2000s they spread further into suburban gardens in many parts of the city, feeding and breeding in planted shrubs (J Davies and A Moorrees pers. comm.); however, the use of gardens by these birds has decreased recently in some suburbs (e.g. Viewbank).

- Eastern Spinebills *Acanthorhynchus tenuirostris* were scarce in the suburbs in the 1970s, though quite common in nearby forest. Since then they have become increasingly common in suburban gardens, mainly as non-breeding winter visitors from February or March to September. They usually occur as single birds, feeding from planted proteaceous shrubs and running a constant gauntlet between the attacks of larger honeyeaters (Red and Little Wattlebirds and Noisy Miners).
- Singing Honeyeaters *Lichenostomus virescens* were rare in Melbourne in the 1970s, and the nearest resident population was on the Bellarine Peninsula. Since then they have become more common in coastal parts of the city, and small resident breeding populations have become established near the coast at Altona, Williamstown, the Mornington Peninsula and probably elsewhere: birds can often be seen in shrubs near coastal beaches (as was the case in Keartland's day, at least near Werribee).
- Bell Miners had become common in the eastern and northern suburbs of Melbourne by the 1970s, in scattered mobile colonies along rivers, in shrubby mixed-species forest and in parks and gardens with abundant eucalypts as in Blackburn. Real estate agents used their presence as a marketing tool ('bellbird belt' = 'leafy suburb'). They continued their expansion into the early 1980s, paradoxically moving into some drier forest during the dry years 1981–83. When the drought broke in 1983 there was a temporary redistribution and decline, and then the expansion continued in the 1990s and 2000s, with colonies establishing along the Yarra River downstream as far as the Royal Botanic Gardens, and further west at the Melbourne Zoo and in forest near Melbourne Airport at Tullamarine. The species also expanded its range into the Mornington Peninsula and the Western Port region. This continued until the drought broke in 2010, when once again there was a sudden decline, with many colonies disappearing along the Yarra River and in various Melbourne suburbs. Perhaps oddly, the new colonies in the Royal Botanic Gardens and the Melbourne Zoo persisted into 2011. Colonies of this species are always mobile, but these conspicuous changes reflect major changes in the total population in the Melbourne area.
- Noisy Miners *Manorina melanocephala* have increased steadily during this period, colonising many suburbs (e.g. Heidelberg) where they were formerly scarce or absent. They are now a dominant species in many lightly treed parks (e.g. Wattle Park) and gardens with scattered trees, and some have colonised inner city parks though numbers there remain quite low. (In Sydney and Brisbane, Noisy Miners have become common in parks and gardens throughout each city.)
- Little Wattlebirds were locally distributed in the 1970s, mainly in coastal suburbs and some parks with many planted native species. Since then they have increased greatly, becoming the most common honeyeater species in many suburbs, especially where high numbers of Proteaceous shrubs have been planted. They often co-exist with Red Wattlebirds, despite the aggressive nature of both species, but over time one or other species usually tends to prosper at the expense of the other. Red Wattlebirds tend to succeed where eucalypts are abundant and Little Wattlebirds tend to succeed where shrubs dominate, although both species will readily feed from the blossoms of both eucalypts and shrubs.
- Lewin's Honeyeaters *Meliphaga lewinii* have always inhabited wet forests east of Melbourne, but since the 1980s they have expanded into similar habitats closer to Melbourne, including the Dandenong Ranges.
- Scarlet Honeyeaters *Myzomela sanguinolenta* were rare vagrants to Melbourne suburbs in the 1970s, with the nearest regular populations being in East Gippsland 300+ km east, where they are mainly summer visitors. Records increased slightly over the next two decades, perhaps partly because of increased numbers of observers. Then in spring 2009, there was an extraordinary influx to many

Melbourne suburbs and surrounding forest, from the lowlands to Mountain Ash forest, with the flowers of Box Mistletoe *Amyema miquelii* being the main food source. The birds remained over summer, and then some moved into lowland habitats (e.g. Banyule Flat) where amazingly they remained over winter before disappearing in August 2010. This may be a freak irruption in unusual climatic conditions, before and during the breaking of the long drought.

- Pied Currawongs *Strepera graculina* were quite scarce in the Melbourne area in the 1970s, being recorded mainly as winter visitors to the Dandenong Ranges and other areas with substantial amounts of forest. Over subsequent decades they have increased in number as winter visitors, and small numbers have started to remain over summer and probably breed in well treed eastern and northern suburbs.
- Little Ravens *Corvus mellori* were common in Melbourne in the 1970s (e.g. up to 200 roosted on tall buildings in Melbourne University), but their numbers have increased in inner and outer suburbs: flocks and breeding pairs are common throughout the area. Lee (2011) describes a process of urban adaptation for this species, with increased nesting in built-up areas such as the CBD from the 1980s.
- Satin Bowerbirds were always found in forests of the ranges east of Melbourne, but in the 1970s they were quite scarce (perhaps because they were persecuted by some fruit growers). They have increased in recent decades, occupying new habitats in the foothills of the Dandenong Ranges (e.g. Monbulk) and increasing in number in the vicinity of Healesville.
- Zebra Finches *Taeniopygia guttata* were rare in the 1970s, and known only from a few locations west of Melbourne such as the edge of the You Yangs. They increased greatly in the latter years of the 1997–2010 drought, and are now quite commonly seen in areas of scrubby farmland west of Melbourne, e.g. the Western Treatment Plant near Werribee.

Decreases 1970s to 2011

Just as many species have decreased in number since the 1970s. Two well-publicised examples are the endangered Regent Honeyeater, which bred annually at Blackburn Lake to the mid 1970s but no longer occurs near Melbourne except as an extremely rare vagrant (Franklin *et al.* 1989), and Swift Parrot, which was a regular visitor to Melbourne parks and gardens in the 1970s, but has become much rarer. But many other species have declined in number and they are listed below. They can be classed in two main groups: birds associated with agricultural land (e.g. Willie Wagtail, Yellow-rumped Thornbill, Australasian Pipit and the introduced Eurasian Skylark, European Goldfinch and Common Starling) and birds formerly associated with parks and gardens (notably White-plumed Honeyeater, also the introduced House Sparrow, Tree Sparrow, Common Greenfinch, Common Blackbird and Song Thrush). Some of these declines have been most dramatic in the dry years of the past decade (2000–10). Common Starlings and Common Blackbirds remain reasonably common in gardens and elsewhere (e.g. Common Starlings along the coast), but several of the other species have declined precipitously. For example, in the suburb of Viewbank five bird species have become locally extinct in the period 2000–10, and four of them (House Sparrow, Tree Sparrow, Common Greenfinch and Song Thrush) are introduced species formerly associated mainly with parks and gardens (R Loyn unpublished data). The fifth species is the Bell Miner, which colonised at the start of the decade but then vanished at the end of it.

- Brush Bronzewings continued to decline on the fringe of Melbourne. In the 1970s and 1980s they were quite common in wet Mountain Ash forests near Toolangi (Loyn 1985), but now they are rarely seen there. Similar declines have been observed in habitats such as tea-tree scrub in the lowlands south and east of Melbourne, where the species persists in low numbers near Cranbourne, in Mornington Peninsula National Park and Western Port but not in close proximity to suburbs.
- White-throated Needletails *Hirundapus caudacutus* were regularly seen in flocks over Melbourne in thundery weather in late summer (December to mid April, especially towards the end of that period). They still occur at those times over nearby forest, but in reduced numbers, and are now rarely seen over Melbourne itself.

- Whistling Kites *Haliastur sphenurus* were quite often present in inner city parks in the 1970s (e.g. Parkville) but became rare in Melbourne, though they are still common near Werribee.
- Brown Falcons *Falco berigora* were often seen over farmland near Melbourne in the 1970s but have become rare close to the city, although they remain common near Werribee.
- Several species of migratory shorebird have declined in parts of Port Phillip including the Western Treatment Plant and the adjacent coast near Werribee (Herrod 2010). However, these declines are best considered in the context of global shorebird declines and changes in intertidal habitats, and are not discussed further here.
- Swift Parrots (migrating from Tasmania) were scarce but expected winter visitors to Melbourne suburbs in the 1970s, e.g. at Monash University, feeding mainly on eucalypt blossom. They became increasingly scarce over subsequent years and are now best regarded as rare passage migrants in the suburbs, although small flocks continue to spend the winter in box-ironbark forest north-west of Melbourne, e.g. near Sunbury. The species is listed as Endangered nationally.
- Orange-bellied Parrots (migrating from Tasmania) were recorded at Fishermens Bend in the Yarra estuary in the 1950s, but most suitable habitat there has been lost through human development. The parrots continued to be recorded as regular winter visitors further south-west along the coast, especially on The Spit Nature Conservation Reserve near Werribee, but numbers have been declining severely since the late 1970s and the species is now Critically Endangered.
- Southern Boobooks have always been quite scarce in Melbourne, despite their wide distribution in nearby forests. Early in the period they were regular winter visitors to some suburbs, and a few pairs bred in suitable habitat such as golf courses. They have certainly declined in some suburbs (e.g. Viewbank, where they are now much less evident than the Powerful Owl) but more observations are needed to assess their general status.
- Superb Fairy-wrens have continued their decline, retreating to riparian vegetation and wetlands with suitable combinations of scrub and open ground. They remain common in those wetter habitats within the suburbs and persist in large diverse parks such as the Royal Botanic Gardens in South Yarra. They also remain abundant in a wide range of natural and modified habitats on the city fringe.
- Pilotbirds were quite common and tame in wet forest in the Dandenong Ranges in the 1970s but declined subsequently and are now rare (E McNabb pers. comm.). Similar declines have been observed in Bunyip State Park and near Healesville, though the species remains common in wet forest at higher elevation, e.g. near Toolangi. This may be a classic retreat up an elevational gradient in response to global warming.
- White-browed Scrubwrens *Sericornis frontatus* were common in some city parks in the 1970s (e.g. Treasury Gardens), as in Keartland's time, but have recently retreated to more shrubby environments, especially in riparian forest along the Yarra River. They remain common in those habitats and in shrubby parks and native vegetation. Until at least 2007 there was a very small population in Fitzroy Gardens and Parliament Gardens, and the species is still present in the Royal Botanic Gardens in South Yarra.
- Yellow-rumped Thornbills continued their decline (see previous sections), retreating from suburban farmland as cattle grazing was phased out from the Yarra flats. They remain fairly common in farmland on the city fringe.
- White-plumed Honeyeaters *Lichenostomus penicillatus* were one of the most common birds in Melbourne in the 1970s, in gardens, parks and riparian forest. They could be found feeding among eucalypts and planted shrubs and trees including exotic deciduous trees. They remain in the inner city, even in small gardens, but since the late 1990s they have become extremely rare in most suburban gardens, and have also declined in native River Red Gum forests along the Yarra and Plenty Rivers (although they can still be found there, in reduced numbers). It is possible that they have been displaced from gardens by aggressive species such as Little Wattlebird, Noisy Miner and Bell Miner.
- Regent Honeyeaters were still present in Melbourne in the 1970s, breeding annually at Blackburn Lake and also occurring in box-ironbark woodlands on the city fringe (e.g.

Plenty Gorge and Diamond Creek area). Since then they have tragically become extinct in Melbourne and extremely rare elsewhere: the box-ironbark forests of north-east Victoria are now their last precarious toehold in the State, and they are classed as Endangered nationally and Critically Endangered in Victoria.

- Red Wattlebirds may have increased during the 1970s and 1980s, becoming one of Melbourne's most familiar garden birds. They are still common but have declined in some suburbs since that time, retreating to native vegetation while Little Wattlebirds have become the more common species in many gardens.
- Grey-crowned Babblers have now disappeared from all but one of their few remnant habitats in southern Victoria. A small group may persist near Mordialloc (D Robinson pers. comm.), but there have been no recent records from other locations on the Mornington Peninsula and Western Port catchment where they could be found in previous decades (Schulz 1991, Lockwood and Robinson 1997).
- Willie Wagtails *Rhipidura leucophrys* were familiar birds on grasslands such as sports ovals in the 1970s, even close to the city (e.g. Royal Park). They remain fairly common but have declined in many suburbs, especially those along the Yarra River where cattle-grazing was phased out.
- Flame Robins *Petroica phoenicea* were regular winter visitors to grazed pasture in some suburbs during the 1970s but declined subsequently as grazing has been phased out from some of those areas. Low numbers continue to visit farmland and wetlands on the city fringe.
- Eastern Yellow Robins *Eopsaltria australis* were widespread in the 1970s–1990s in remnant areas of native vegetation within some Melbourne suburbs. They declined during the drought of 1997–2010 and became confined mainly to riparian vegetation, e.g. along the Yarra River, and to extensive forest on the city fringe.
- Eurasian Skylarks *Alauda arvensis* (introduced) were reported as resident in grasslands in the middle suburbs in the 1970s (e.g. Warringal Conservation Society 1981) but they no longer occur there. They remain common in farm pastures on the city fringe.
- Fairy Martins *Petrochelidon ariel* were quite common along the Yarra in the 1970s, with a well-known nesting colony under the Bourke Road bridge in Ivanhoe. They fed mainly over grazed pasture on the Yarra Flats, and have declined steadily as commercial cattle grazing has been phased out from these suburban areas. Low numbers may still breed along the Yarra but the species now occurs mainly as a passage migrant: it remains a common summer visitor in farmland on the city fringe.
- Red-whiskered Bulbuls *Pycnonotus jocosus* (introduced) were resident in low numbers in the Royal Botanic Gardens in South Yarra in the 1970s but disappeared in 1982–83. Low numbers were seen occasionally in subsequent years from widely scattered suburbs, especially along the Yarra River. However, none of these satellite birds and pairs appeared to establish a resident population and the species may now be locally extinct.
- Common Blackbirds *Turdus merula* (introduced) declined in many suburbs during the drought of 1997–2010, though they remain fairly common and widespread. For example, hundreds could be seen scattered over well-watered lawns in the Fitzroy Gardens in the 1980s and 1990s, but they became scarce during the drought.
- Song Thrushes *Turdus philomelos* (introduced) declined massively during the drought of 1997–2010 and are now hard to find in Melbourne and locally extinct from many suburbs. For example, they were previously often seen with Common Blackbirds in the Fitzroy Gardens, but few if any remain.
- Common Starlings *Sturnus vulgaris* (introduced) were often claimed to be Victoria's most common bird in the 1960s (e.g. Wheeler 1967), although this assessment was based on casual observations, not on accurate estimates of population density. The species remains very common in farmland and rural towns, particularly along the coast, but in the Melbourne area it has declined during the drought of 1997–2010. It has also retreated from suburban areas where cattle were formerly grazed on the Yarra River flats.
- Red-browed Finches continued to decline during the 1997–2010 drought, but remain present in low numbers along the Yarra River and in a range of suitable habitats in the Melbourne area.
- Chestnut-breasted Mannikins *Lonchura*

castaneothorax (introduced) were recorded at several widely scattered locations in Melbourne in the 1970s, including at Banyule Flat (Menkhorst 1976), and flocks up to 15, and two pairs nesting, at La Trobe University in 1977 (Emison *et al.* 1987). Most were associated with wetlands containing Common Reed *Phragmites australis* or Cumbungi *Typha orientalis*. There are very few records in recent years and the species appears to be locally extinct.

- House Sparrows *Passer domesticus* (introduced) decreased massively during the drought of 1997–2010, becoming locally extinct in many suburbs such as Gardiners Creek (Peter 2011) and Viewbank. In the 1970s and 1980s they were common in all built-up areas, but they then contracted to areas with abundant food, such as bakeries and gardens where poultry or domestic birds were kept in captivity (and the supplied food was available to sparrows). In the 2000s they disappeared even from many of those potentially rich food sources. They remain present in the inner city and some heavily built-up suburbs (albeit in much lower numbers than previously), and in specialised habitats such as food courts (e.g. at Melbourne Zoo) and shopping centres (where they are often found inside the buildings). They also remain fairly common in farmland on the city fringe.
- Eurasian Tree Sparrows *Passer montanus* (introduced) decreased massively in parallel with House Sparrows, from a much lower initial base. In the suburb of Viewbank, they persisted locally later than House Sparrows, but were last seen in 2004. At Melbourne Zoo they were common in the 1980s and 1990s (perhaps because their small size gave ready access to food in cages) but now they are rare there and in Melbourne generally. At the Eastern Treatment Plant they became common late in the decade (with flocks up to 35 in 2010, M Carter pers. comm.) but then disappeared.
- Australasian Pipits *Anthus novaeseelandiae* were reported as rare visitors to grasslands near Heidelberg in the 1970s (Warringal Conservation Society 1981), but there have been no recent records from those areas. They have also declined as passage migrants at Albert Park Lake (M Talmage pers. comm.). The species remains reasonably common in farmland, airports and wetlands on the city fringe.
- Common Greenfinches *Carduelis chloris* (introduced) also decreased massively during the 1997–2010 drought, becoming locally extinct in many suburbs such as Viewbank and Heidelberg, where they formerly nested regularly in conifers such as cypresses (e.g. at the Heidelberg cemetery in Brown St). Small populations remain on the city fringe, mainly where conifers grow near coastal wetlands.
- European Goldfinches *Carduelis carduelis* (introduced) decreased markedly during the drought of 1997–2010, and are now extremely rare in some suburbs (e.g. Viewbank) which previously supported sparse resident populations. For example, flocks used to make regular autumn visits to planted Plane trees *Platanus* sp. in Heidelberg, but no longer do so. They remain reasonably common in farmland and wetlands on the city fringe.

Discussion

Clearly there have been some major changes in Melbourne's bird fauna, at various times in the history of the city. The main changes can be summarised as follows:

- Loss of lowland forest and woodland species as trees were cleared to make way for farmland or housing in the 19th century (e.g Swift Parrot, Brown Treecreeper, Hooded Robin, Regent Honeyeater).
- Initial increases in species that inhabit farmland, followed by decreases in some of those species as farmland gave way to more housing in the 20th and 21st centuries (e.g. Yellow-rumped Thornbill, Willie Wagtail).
- Declines in species that were widely hunted or persecuted as pests during the 19th century, followed by increases in those species during the 20th century in response to protective legislation and cultural change (e.g. Common Bronzewing, ducks, lorikeets, honeyeaters).
- Spectacular waves of colonisation in the past few decades as new habitats developed for particular species in gardens and parks, and those species found and exploited those habitats (e.g. cockatoos, Rainbow Lorikeet, Crested Pigeon).
- Declines of many species during the dry years and drought of 1997–2010, with introduced European species being the most vulnerable.

Comparing recent experience with that of Keartland has been an interesting exercise, from various points of view. Keartland relied

on an eclectic mix of personal experience and anecdotal information, and we did the same even though there were more systematic data available to us in the Victorian Biodiversity Atlas and survey records from BOCA. The anecdotal information had already been processed by us mentally, whereas a proper scrutiny of VBA and BOCA data would require much effort in data-cleaning and sophisticated analysis. This would be a useful task but was not logistically possible for the current exercise. Conole and Kirkpatrick (2011) used Atlas data from 1998–2002 to provide a useful snapshot of bird distribution in Greater Melbourne, and hopefully this will encourage further work of that sort in relation to historical and spatial trends. Other reviews or analyses of recent Melbourne bird fauna have been presented by Green *et al.* (1989), Brereton *et al.* (2004) and Palmer *et al.* (2008). The best way to facilitate comparisons over time is through a combination of systematic monitoring from selected sites, and capture of anecdotal information through systems such as the VBA and periodic reviews.

Keartland sounded some strong warnings about the declines he observed in various species. And mostly he got it right: those species included Swift Parrot and Regent Honeyeater, both of which are now listed as Endangered nationally. It is a pity that the authorities did not take more notice of that warning over a century ago: when species change from very common to extremely scarce, it is surely a sign that they are in trouble and important ecological changes need to be managed.

Keartland's narratives need to be interpreted with respect to the very different conditions experienced over 100 years ago. For example, transport was challenging and relied mostly on trains, horse-drawn carts and walking long distances, and his observations tended to be from a low number of favoured sites including the Dandenong Ranges, Ringwood, Bayswater, Heidelberg, Oakleigh, Clifton Hill, Melton and the 'mudflats at the mouth of the Yarra'. From his accounts of the birds he found in those places, it is obvious that there have been big changes in the habitats represented: for example, there are now few mudflats at the mouth of the Yarra. There has been a huge upsurge in the popularity of birding since Keartland's time, and the facilities available to birders (notably cars, optical equipment, and identification guides). Hence there is now a much greater likelihood that vagrant or localised species will be detected. However, most of the general changes reported here are not sensitive to these issues: for example, the recent dramatic increases in cockatoos, corellas, lorikeets and Crested Pigeons would have been quite obvious to observers working under conditions applying in Keartland's time.

One frustration with Keartland's account is that he sometimes lapses into telling us things we already know about the appearance and behaviour of the birds, and does not give us the detail we would like about their distribution and habitat selection in Melbourne at the time of writing. We can see that our paper may also cause frustration to future workers, who may lament our focus on change over time and wish that we had provided a concise systematic list describing the current distribution and habitat use of birds in the greater Melbourne area (including species which have shown little change, and escape mention in this paper). The VBA may help generate such a snapshot, but we recognise the need for a good annotated systematic list and hope that this paper may help stimulate its production.

Character of change

This paper has described some of the changes at the species level, and more needs to be done in analysing those changes in terms of bird guilds. However, some trends are clear and worth highlighting. Changes in habitat guilds are mentioned below because they relate clearly to gross changes in habitat as Melbourne developed from the 19th century to the present. More recent changes are evident in the dominance of particular feeding and nesting guilds. Hollow-nesting birds have proliferated in recent decades, despite competition from introduced European Starlings and Common Mynas *Sturnus tristis* (see below). Large seed-eating birds have also proliferated: this may be part of the same phenomenon, because hollow-nesting parrots constitute the major portion of both guilds. In general, many small birds have become less common in recent decades, and some large birds have become more common: this was the main comment made to us by M

Carter (pers. comm.) in a brief discussion about recent changes. Conole and Kirkpatrick (2011) identified hollow-nesting and medium body size as traits associated with urban adaptation in Melbourne. Catterall *et al.* (1997) have made similar observations in fragmented habitats of south-eastern Queensland, where they documented declines in small migratory passerines and increases in 'iconic Australian species' such as Laughing Kookaburra and Australian Magpie *Cracticus tibicen*. Overall, Melbourne's bird fauna has recently become more dominated than it was by large iconic species (notably lorikeets, cockatoos and Crested Pigeon) and less dominated by small birds including introduced European species.

Causes of change

Many of the changes we have documented here have quite obvious causes. Woodland species disappeared as woodland habitats gave way to farmland or housing; farmland species prospered initially but then declined as farmland was converted to housing. The species that persisted were those that could make use of the mix of habitats provided in the greater urban environment. Open-country species such as Australian Magpie remain common because a sports oval provides habitat that is almost as good as a grazed paddock (as long as nest trees are available nearby in both cases), whereas other open-country birds such as Yellow-rumped Thornbill and Willie Wagtail may notice the lack of shrub or tree cover and the lack of productivity bestowed by grazing herbivores: insects are more attracted to cow-pats than the residue of mowing machines.

Not all the observed changes are mediated by such obvious changes in habitat. Hunting and persecution were clearly big factors in Keartland's time, suppressing populations of birds that were considered good to eat (e.g. Common Bronzewing, Australian Wood Duck and Australian Magpie) or were considered as pests especially to fruit growers (e.g. lorikeets and honeyeaters). Some of those species have increased subsequently, in response to legislative protection and cultural change in public attitudes to killing birds.

Competition between bird species may well have played a part too. Hyper-aggressive honeyeaters can play pivotal roles in shaping Australian ecosystems, as shown for Bell Miners and Noisy Miners (Dow 1977; Loyn *et al.* 1983; Grey *et al.* 1997, 1998; Loyn 1987, 2002; Howes and Maron 2009). Red Wattlebirds, Little Wattlebirds and White-plumed Honeyeaters may contribute to the complex array of interactions between warring groups of these birds, and the dynamics between them seem to be extremely fluid, changing rapidly between years and suburbs.

Introduced birds are often blamed for declines in native species, with Common Mynas often bearing the brunt of such accusations (as reported by Dooley 2011). Competition for nest hollows is often cited as a causal mechanism. However, many of the native species that have increased spectacularly in recent years (including all the parrots) are hollow-nesters. Records from the Victorian Biodiversity Atlas suggest that native hollow-nesters have doubled in abundance in the Melbourne area since 1980, compared with other species (R Loyn and S Leech unpubl.). It seems that hollows are not a major limiting factor in the Melbourne area as a whole, although they may well be a limiting factor in particular suburbs where few old trees remain. The dynamic state of Melbourne's bird fauna offers some exceptional opportunities for research into competition for nest sites and also for food supply. Several seed-eating species are new additions to the fauna, and some of them (notably the cockatoos and corellas) still appear to be sorting out how to partition resources between them.

Climate change has clearly played a part. Theories of global warming would suggest that Melbourne's bird fauna would acquire increasing representation of birds from further north (Eyrean and Torresian zones), and fewer migrants from Tasmania. This has indeed been observed, with most of the recent increases involving species from the arid Eyrean zone and one (Rainbow Lorikeet) with a broad distribution on the eastern seaboard (including the Torresian zone). Several other species from the eastern seaboard have occurred increasingly as vagrants (e.g. Common Koel). In contrast, two migrants from Tasmania (the southernmost part of the Bassian zone) (Swift Parrot and Orange-bellied Parrot) have declined and are now classed as highly threatened. This accords with expectations, but it should be noted

that there are many species with ranges centred north of Melbourne and relatively few that migrate regularly across Bass Strait from Tasmania (and most of those migrants, except the two parrots mentioned above, also breed locally, hence it is hard to assess the extent of migration). Global warming also suggests that ranges of some species should contract altitudinally. Our observations provide one example of such change (Pilotbird) but many species from the ranges have recently become more common in Melbourne, mainly as non-breeding winter visitors but with low numbers probably breeding as well (e.g. Yellow-tailed Black-Cockatoo and Pied Currawong), perhaps in response to artificial habitat enhancement. Hence our observations provide very limited support for expected altitudinal shifts (Pilotbird being the only example).

Droughts can provide the motivation for large groups of birds to move from arid parts of their range, and if they find suitable habitat they may stay and establish resident populations. This may have been the initial impetus for the waves of colonisation by various cockatoo species and Crested Pigeon in recent decades: numbers arrived during droughts of 1971 (Galah), 1981-83 (Sulphur-crested Cockatoo and corellas) and 1997-2010 (Crested Pigeon), and persisted subsequently. Several human factors may contribute to their success. For example, Crested Pigeons sometimes established pioneer populations near pony clubs or hobby farms where hay and grain were fed to the horses during the drought. They shared this resource with small flocks of Feral Pigeons *Columba livia*, but other resident pigeons (Common Bronzewing and Spotted Dove) seemed to make relatively little use of this new food source, remaining within their preferred habitats of woodland and built-up areas respectively.

Management of parks and gardens has undoubtedly played a role in precipitating some of the recent changes in bird species. Eucalypts, wattles and other trees were widely planted, and many are now old enough to provide abundant resources such as nectar, seed, fruit and hollows. In the latter half of the 20th century it became increasingly fashionable to plant native shrubs, often of Protecaceous species, and these proved attractive to honeyeaters such as Little Wattlebirds and Eastern Spinebills. Wattles such as Silver Wattles *Acacia dealbata* have provided food for granivores (e.g. Common Bronzewing), insectivores (e.g. Brown Thornbill and Yellow Thornbill) and facultative granivore/insectivores such as Yellow-tailed Black-Cockatoos.

Well-watered green lawns were considered an essential component of suburban gardens for many years, but this fashion was challenged when charges were introduced for water use in the 1990s. Water restrictions were then imposed during the dry years and drought of 1997–2010, and watering lawns was prohibited towards the end of that period. This undoubtedly reduced available habitat for introduced European birds such as Common Blackbird and Song Thrush, which used suburban lawns as a key feeding habitat. Two introduced Asian species (Spotted Dove and Common Myna) were more resilient and showed little change during that period. The decline in introduced House Sparrows and Eurasian Tree Sparrows may be partly related to drought conditions, though these species have declined in cities throughout the world: the decline is sometimes attributed to reductions in invertebrates, which form an important food supplement for these mainly granivorous birds (del Hoyo *et al.* 2009; Peter 2011). In the 1990s sparrows often were found, mainly in gardens where food was supplied for captive birds such as poultry, pigeons or pet parrots, and this is now rarely the case and Spotted Doves have occupied that niche. It is not clear what has provided a competitive advantage to the Spotted Doves (or disadvantage to the sparrows), but we suggest the answer may lie in the commercial food mix supplied to domestic animals rather than climatic conditions or reduced invertebrate abundance.

In terms of conserving native birds in the greater Melbourne area, the most important management actions have been the conservation of native vegetation, including samples of native forest, grassland and wetlands. This has allowed Melbourne to continue to support a high proportion of the bird species that inhabited the area in the 20th century, as recognised by others (Green *et al.* 1989; Brereton *et al.* 2004; Palmer *et al.* 2008). Planting of indigenous species has also helped greatly, except where this

has served mainly to attract hyper-aggressive honeyeater species. We should lament the loss of species such as Regent Honeyeater, but also celebrate the survival of many others, including iconic species such as Powerful Owl that appear to be thriving in some of our suburbs. And we should heed the warnings about declining species, in Melbourne or its hinterland, and do what we can to improve their chances for survival.

Acknowledgements
We thank John Harris (FNCV) and the organising committee of the FNCV biodiversity symposium for inviting us to prepare this paper; Alan Yen (DPI) for providing Keartland's paper and suggesting its use as a benchmark, and Scott Leech (DSE) for extracting data from the Victorian Biodiversity Atlas. Several people provided information on particular subjects, including Mike Carter, Jeff Davies, Lyn Easton, Ed McNabb, Adrian Moorrees, Doug Robinson, Danny Rogers, Don Teese and Dale Tonkinson. Many people have shared their observations with us over many years and we are grateful to all. The paper was improved by comments from an anonymous referee.

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Received 11 August 2011; accepted 22 September 2011

Satin Bowerbird *Ptilonorhynchus violaceus*. Photo by Dan Carey.

Above: New Holland Honeyeater *Phylidonyris novaehollandiae*.
Below: Australian Pelican *Pelecanus conspicillatus*.
Photos by Maria Gibson.